

REMARKS

This Amendment is in response to the Office Action mailed March 14, 2003.

Accordingly, the Amendment is accompanied by a petition to extend the time for response 2 months, together with the required fee.

Section 102 Rejections

Claims 1, 26 - 29, 33, 36, and 40 - 41 stand rejected under 35 USC §102(b) as being anticipated by Kokubo, U.S. Patent No. 5,530,456 ("Kokubo").

Claims 1, 22, 23, 26 - 29, 33 - 36, and 40 stand rejected on the same basis as being anticipated by Bidiville et al., U.S. Patent No. 5,288,993 ("Bidiville"). Independent claims 1, 34, 35 and 36 have been amended to clarify and explicate the claimed invention. Amended claim 1 has been amended to recite a sensor comprising a photo-emf material. Amended claims 34 and 35 recite a sensor for receiving a moving speckle pattern of light and producing a sensor electrical signal related to said movement of said pattern for controlling an apparatus.

Amended claim 36 recites receiving from the surface of a hand a changing distribution of irradiance and producing a sensor electrical signal related to said changing distribution of irradiance for controlling an apparatus. Claims 33 and 40 have been cancelled, without prejudice. Applicants respectfully traverse the rejections.

Kokubo

With reference to Figure 6 of Kokubo, a narrow beam 3 is directed at a reflecting surface 6, and the reflection of the beam is directed at a detector 2a. The beam sweeps across the detector in response to movement of the reflector surface, and the beam is narrow enough with

respect to the spacing of adjacent light receiving elements A and B of the detector (see Kokubo Figure 4) to either:

(a) excite the light receiving element B, but not element A (reference Kokubo Figure 6A);

(b) excite the light receiving element A, but not element B (reference Kokubo Figure 6C) ; or

(c) excite both elements at once in moving from one element to the other (reference Kokubo Figure 6B).

A logic circuit is needed to determine direction of movement of the reflecting surface based on knowledge of how the states (a), (b), and (c) change. For example, a change from state (a) to state (c) and then to state (b) implies that the beam has changed its position in the direction indicated in Figures 6A - 6C.

Bidiville

Bidiville discloses a mouse-like device containing a "speckled" ball which is illuminated. An image of the illuminated portion of the ball is focused by an optical element onto a photosensitive array. Logic associated with the photosensitive array determines movement of the ball.

A photodetector generates a current proportional to the intensity of the light reflected off the ball. The current is compared with a threshold to decide whether the pixel is white or black,

i.e., defines an “edge”. The state of the pixel is then stored in a first memory. The process is repeated and a new state of the pixel is stored in a second memory. A “temporal intensity change” (“tic”) of a pixel is determined by comparing the states of the first and second memories. Comparators receive information from neighboring pixels and “correlator logic” is used to determine therefrom whether an edge has moved to the left or to the right, up or down.

Comparison with the Present Invention

Both Kokubo and Bidiville merely sense discrete values of location and time at which a light beam is either present or not. Logic is required to *deduce* that the beam has moved and the direction of its movement. By contrast, the sensor comprising a photo-emf material recited in claims 1 - 32 generates an electrical signal responsive to *changes* in a distribution of irradiance, as explained in Applicants’ specification at page 9. The present invention is able to sense the motion of the beam during and as a consequence of its movement. This provides many outstanding practical benefits. As one example of these benefits, note that the beam width in Kokubo must be small enough to aim at and thereby excite one of the two detectors without activating the adjacent detector while, using a sensor comprising a photo-emf material according to the principles of the present invention, beam width is not critical. Even a large diameter beam that cannot be directed so as to discriminate between two detectors as required by Kokubo may nevertheless be exploited according to the present invention.

Independent claims 34 and 35 recite that the sensor is adapted to sense motion of a speckle pattern received as a result of illuminating a diffusely reflecting surface with coherent light.

By contrast, Bidiville strives to image the surface of the ball on its photosensitive array and does not teach or suggest use of a coherent light source. Kokubo mentions use of a laser;

however, it does not teach or suggest using phase information in the laser light to detect motion as in the claimed invention. Particularly, the claimed speckle pattern is a distribution of light irradiance within the beam. The distribution results from interference of the coherent light. The speckle pattern includes areas of high irradiance as a result of constructive interference of light having the same phase and areas of low irradiance as a result of destructive interference of light that is out of phase. This principle of operation is based on what is known in the art as “wave optics.”

On the other hand, both Bidiville and Kokubo make use of what is known in the art as “geometric optics.” Precise geometric relationships, e.g., the angle of incidence of the light on the reflecting surface, and the angle of reflection of the light from the reflecting surface, and therefore the location in three dimensional space of the reflecting surface with respect to the light beam, is critical to making the Bidiville and Kokubo devices work. Use of phase information in the present invention eliminates this need to provide precise geometry providing outstanding flexibility. Moreover, by employing wave optics principles, a reflected light beam according to the present invention may be stationary, and yet provide complete information about complex three-dimensional movement of the reflecting surface. By contrast, using geometric optics, Kokubo requires that the beam be moved, and can deduce therefrom only the limited information that the beam has moved to the left or to the right.

In addition to the fundamental distinctions mentioned above, independent claim 34 as originally presented was distinct from Kokubo at least in that it recited a support member for *movably* supporting a case on a surface, and claim 34 was distinct from Bidiville at least in that it recited a light source disposed within the case for illuminating the surface on which the case is

movably supported. The dependent claims as originally presented all recited distinctions over both references as well.

Section 103 Rejections

Claims 17 - 25, 30 - 32, and 37 - 39 stand rejected under 35 USC §103 as being unpatentable over Kokubo. The Examiner has stated that, while Kokubo does not disclose that the light source is coherent, using a coherent light source is well known in the art, and it would have been obvious to use a coherent light source in Kokubo because “this well known light source works as well as . . . Kokubo’s light source.” In fact, Kokubo may employ a coherent light source as a convenient means for producing a small diameter “beam-like ray of light” (Col. 2, lines 44 - 47). In any event, Applicant respectfully traverses the rejections. Rejected claims 17 - 25 and 30 - 32 have all been amended to recite a sensor comprising a photo-emf material. As explained above, the photo-emf material provides a fundamentally different sensing mechanism than that disclosed in Kokubo. Amended independent claim 36, from which remaining claims 38 and 39 depend, recites a particular human-machine interface method not taught or suggested by Kokubo. For example, Kokubo does not teach or suggest producing a sensor electrical signal related to a changing distribution of irradiance, because the detector in Kokubo is not capable of sensing changes in a distribution of irradiance in the first place.

It is respectfully submitted that new claims 42 - 48 patentably distinguish over the references of record at least for the same reasons provided above. Accordingly, the examiner is

respectfully requested to allow claims 1, 3 - 32, 34 - 36, 38 - 39, and 42 - 48, and pass this case to issue.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Garth Janke", is written over the typed name.

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